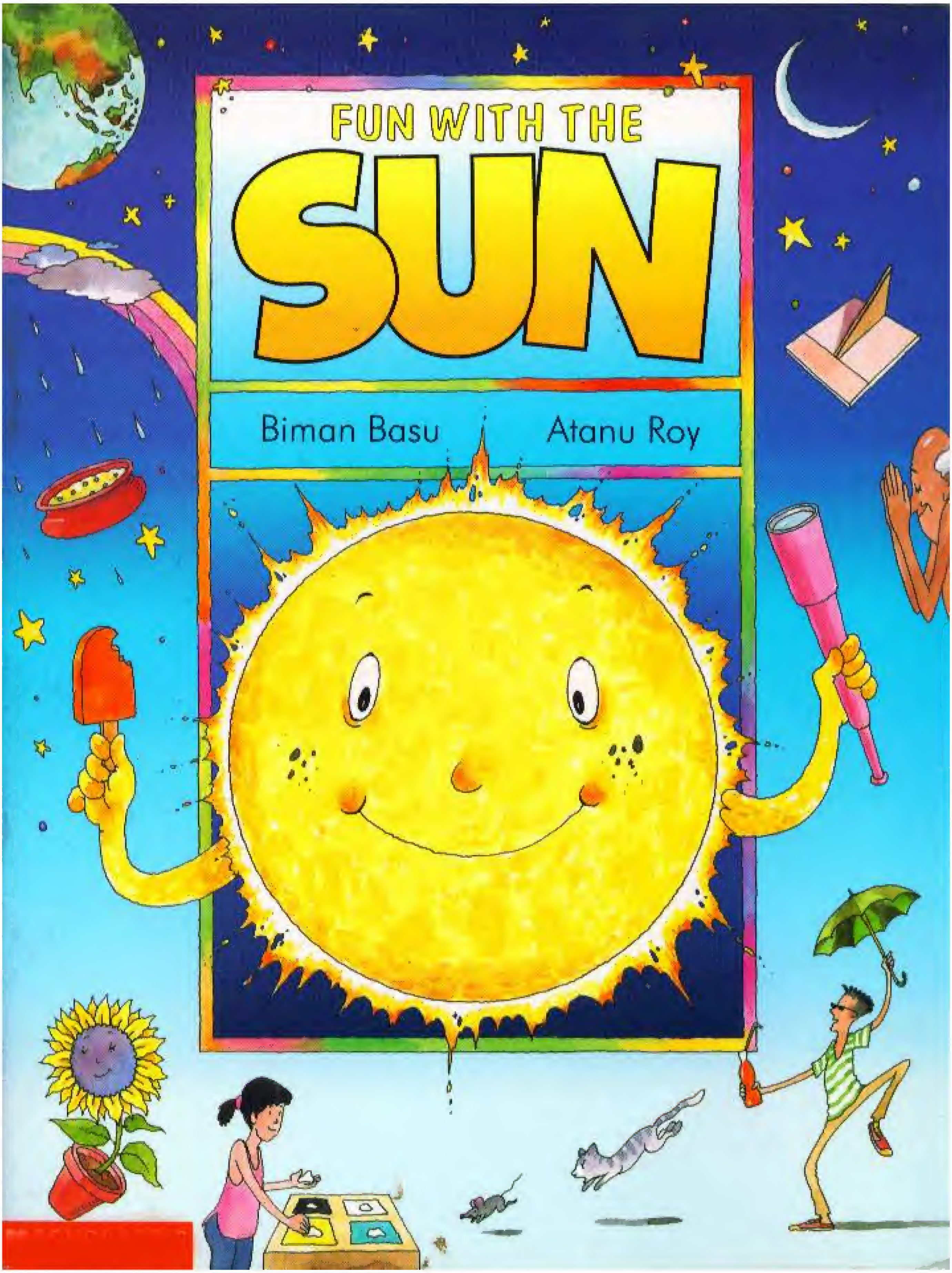
FUN WITH THE
SUN
Biman Basu
Atanu Roy

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Illustrated by
Atanu Roy

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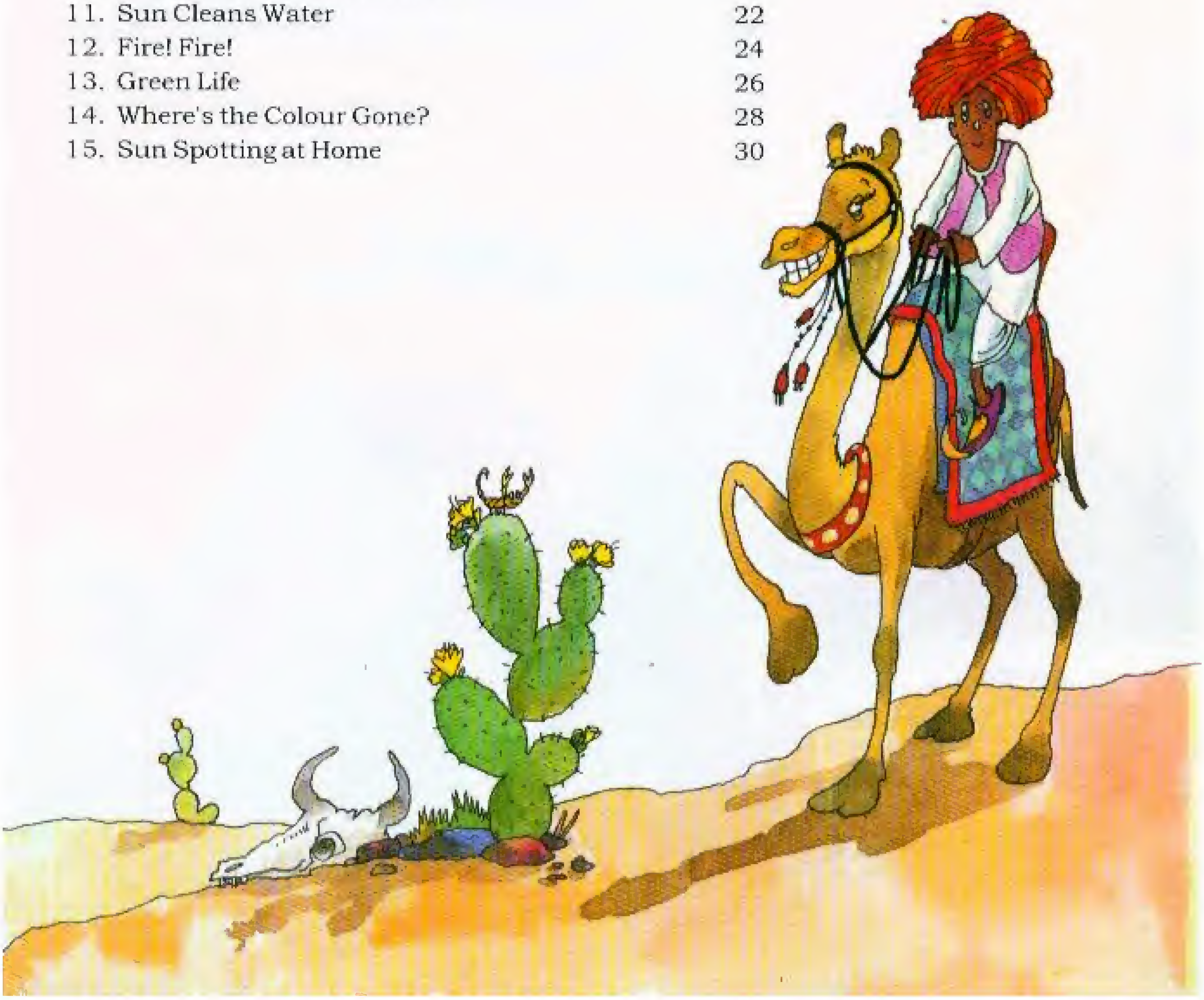


Sun Gives Us Life

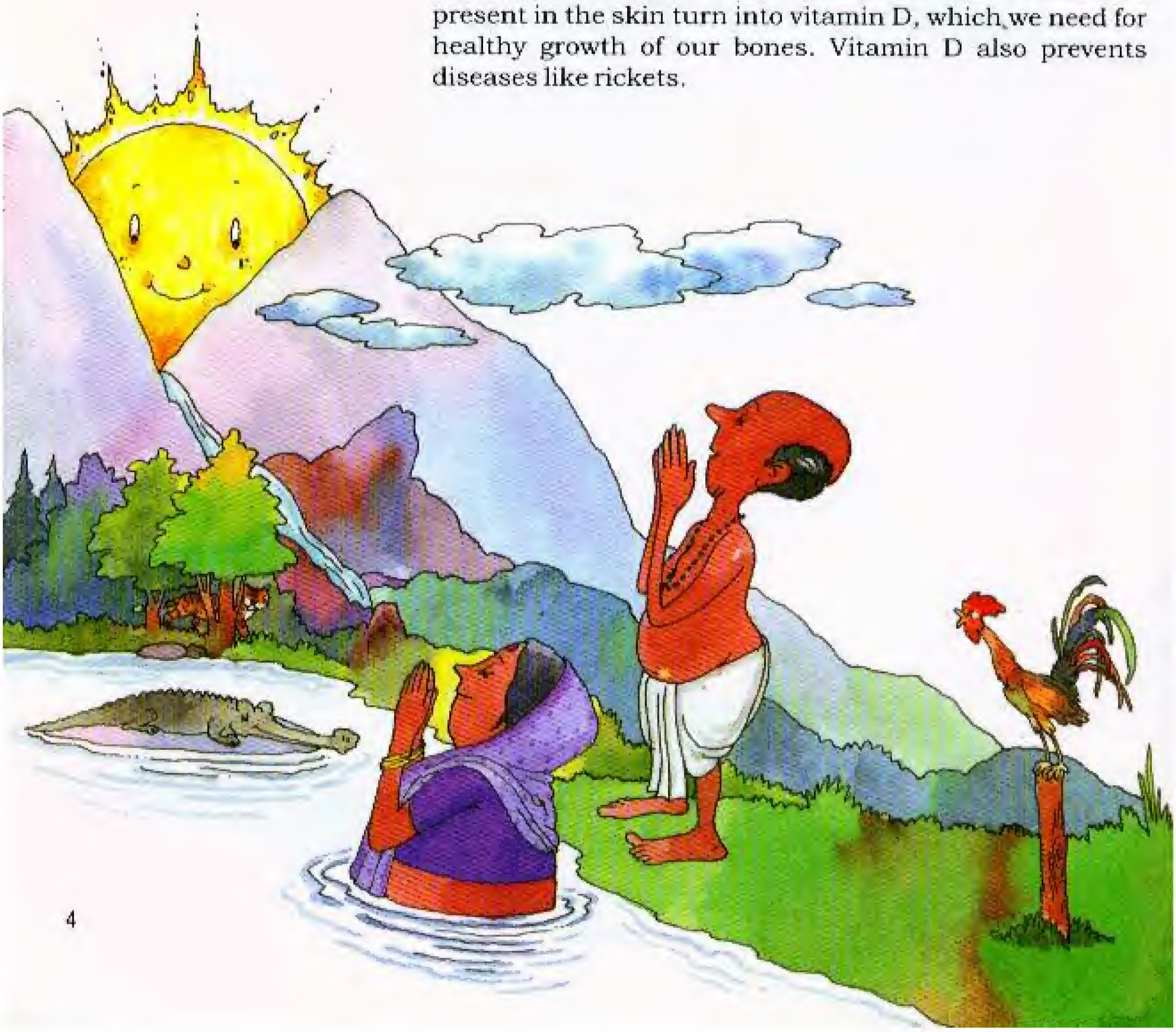
Do you know what is the brightest object in the sky? Of course, it is the Sun.

The Sun is actually a star - a giant ball of hot gases and fire - some 1400 million kilometres in diameter. But it appears so bright and hot because it is much closer to us than the other stars.

The Sun is very important to all of us. When it is up we call it day. After it sets, it is night.

The Sun gives out light that helps plants grow and produce food for us.

When sunlight falls on our skin, some chemicals present in the skin turn into vitamin D, which we need for healthy growth of our bones. Vitamin D also prevents diseases like rickets.



The average distance of the Sun from Earth is almost 150 million kilometres. Yet we get enough light, heat and energy from it that sustains life.

The Sun also makes the seasons and gives us the winds, rain and storms.

Without the Sun there would be no life on Earth. No wonder, the Sun has always been looked upon with reverence by people and worshipped. There are Sun temples in many countries. In India, the Sun temple of Konark in Orissa is famous.

The Sun can also provide you with hours of fun. Let us see how.

The surface temperature of the Sun in about 6000 degrees Celsius (the temperature of the hot glowing filament of a 60-watt electric light bulb is about 2000 degrees), but its inside is several times hotter. The temperature at the centre of the Sun is more than 15 million degrees Celsius.

Sun Temple
Konark

Day and Night

We all know that the day begins at sunrise. But does the Sun rise at the same time at all places on Earth?

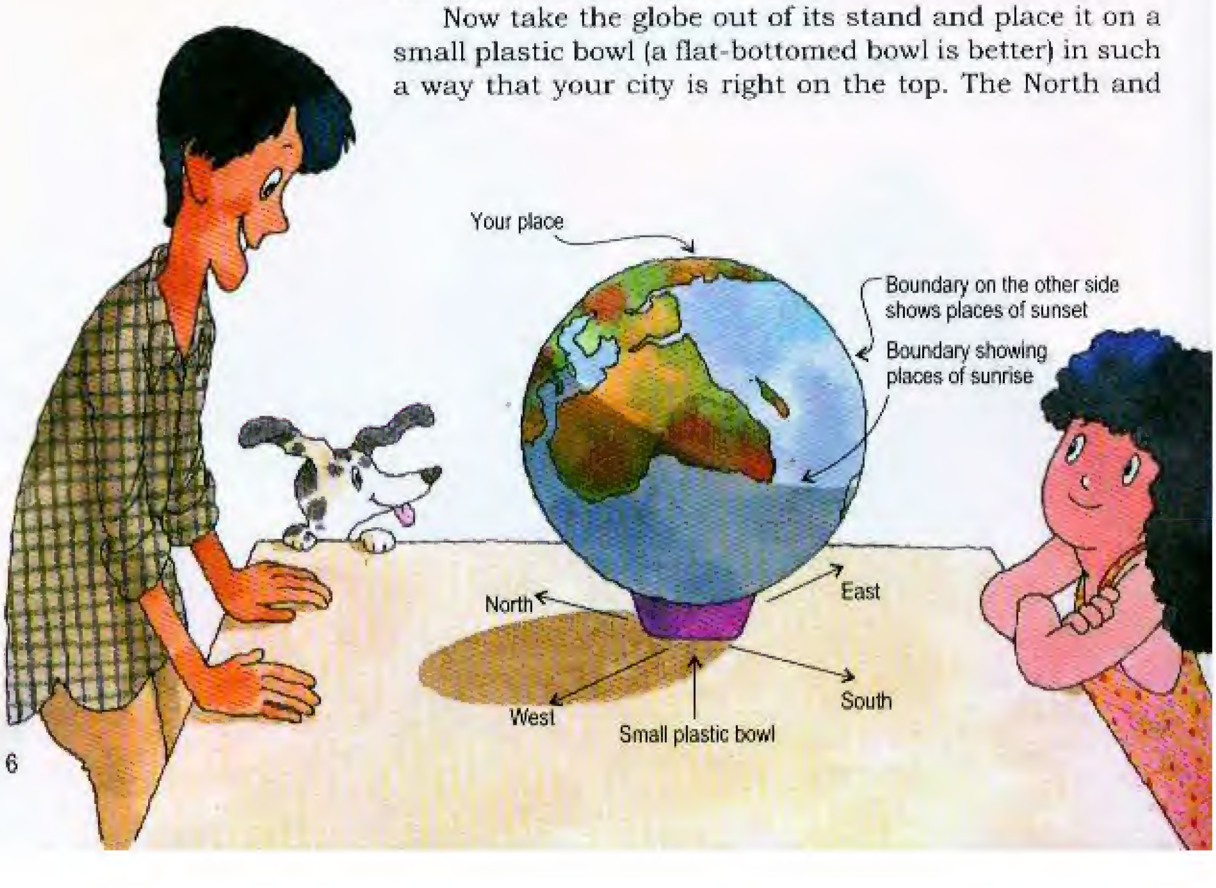
No, it does not. When it is daytime in India, it is night in the U.S., Canada and the countries of South America. That is why we always get to watch a cricket match live in the West Indies in the dead of the night in India.

Do you know why this happens? It is because our Earth is like a giant ball, which spins like a top. When it spins, one side of it faces the Sun. There it is day. On the other side, away from the Sun, it is night.

You can find out for yourself where on the Earth the Sun is rising and where it is setting on any sunny day if you have a globe.

Find an open space on the terrace, in the lawn or a courtyard, where direct sunlight is available for a few hours at least. Then, using a magnetic compass, find out which way is the north and south. (You can do it using the shadow of a stick, as you'll see.)

Now take the globe out of its stand and place it on a small plastic bowl (a flat-bottomed bowl is better) in such a way that your city is right on the top. The North and



South poles of the globe should point in the correct north-south direction. Of course, you have to make sure that the globe is fully in the Sun, without any shadow falling on it.

Look at the globe. You'll notice that sunlight falls on one half of it. The other half is in the shade.

The boundary between the sunlit and shaded portions marks the places where the Sun is either rising or setting. The boundary on the west side of the globe (which is turned away from the Sun in the morning) marks the places of sunrise. The boundary on the east side (which is turned towards the Sun in the morning) marks the places where the Sun is setting. If you wait for a few hours, you'll find that the boundary has moved, showing new places where the Sun is rising or setting at that instant.

Look at the globe early in the morning or late in the afternoon. You'll see the boundary creep away from your city as the Sun climbs higher in the sky. It comes close to it as the Sun dips towards the horizon at the end of the day.

If you look at places around the poles in summer, you'll find that the Sun does not rise at all around the South Pole and it does not set around the North Pole. In winter, the opposite happens. The Sun does not set around the South Pole and does not rise around the North Pole.

The outermost part of the Sun is the corona, which is made up of a mixture of charged gas atoms, called ions, and electrons at temperatures of over a million degrees Celsius. But it does not radiate much heat or light because the gas ions are very thinly distributed. During a total solar eclipse, when the Moon covers the bright face of the Sun, the corona appears as a faint halo around the dark Sun.

Summer and Winter

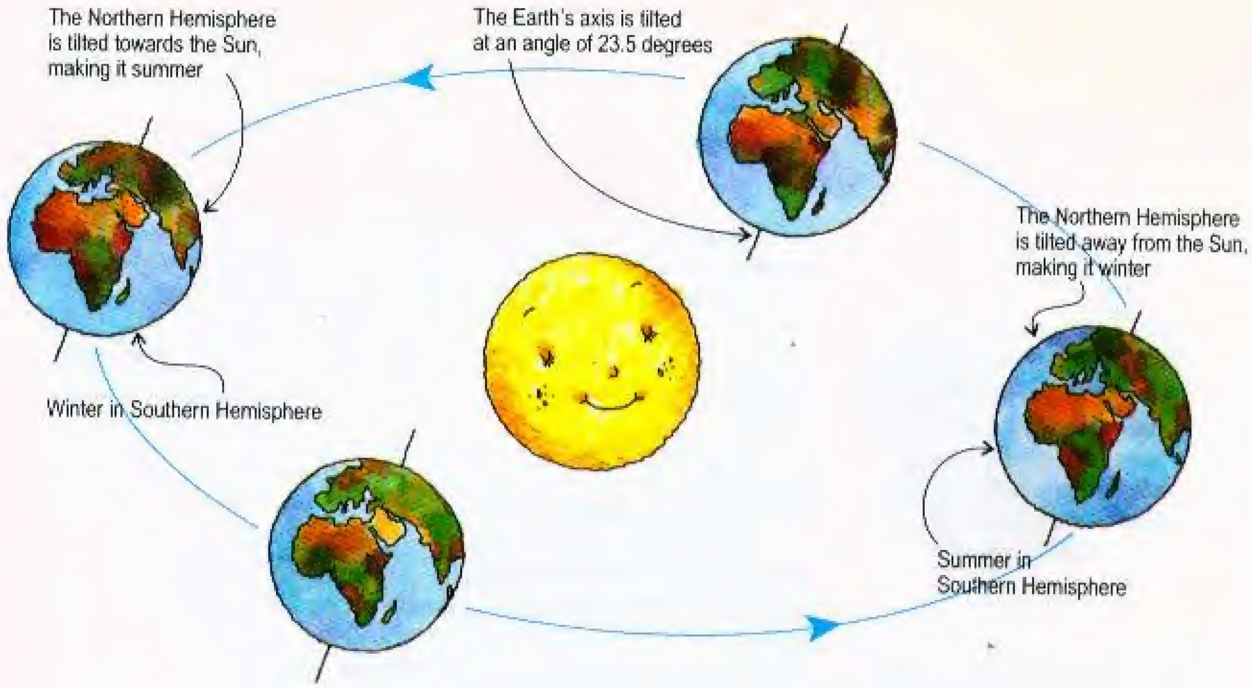
The Sun is actually 5 million kilometres nearer to the Earth when it is winter in the Northern Hemisphere than in summer.

It is always hot in summer and cold in winter. Is it not? Well, it is because of the changing position of the Sun in the sky.

The Earth is not flat. It is curved. So at different places on its surface, the sun appears at different positions in the sky. For example, at places near the equator, it appears high up in the sky, while at places far away from the equator it appears low in the sky.

In those places where the Sun appears high in the sky, the light from the Sun reaches the ground almost at right angles. So the heating is more and such places are usually hot. On the other hand, in those places where the Sun appears low in the sky, the sunlight reaches the ground obliquely. Such areas receive less heat and are therefore cooler. That is why all places near the equator are hot and those away from it have temperate or cold climate.

You can find out how the change in the angle of the Sun changes the amount of heat produced. You will need three or four pieces of cotton cloth, about 10cm square each, and three or four wooden or plastic boards.



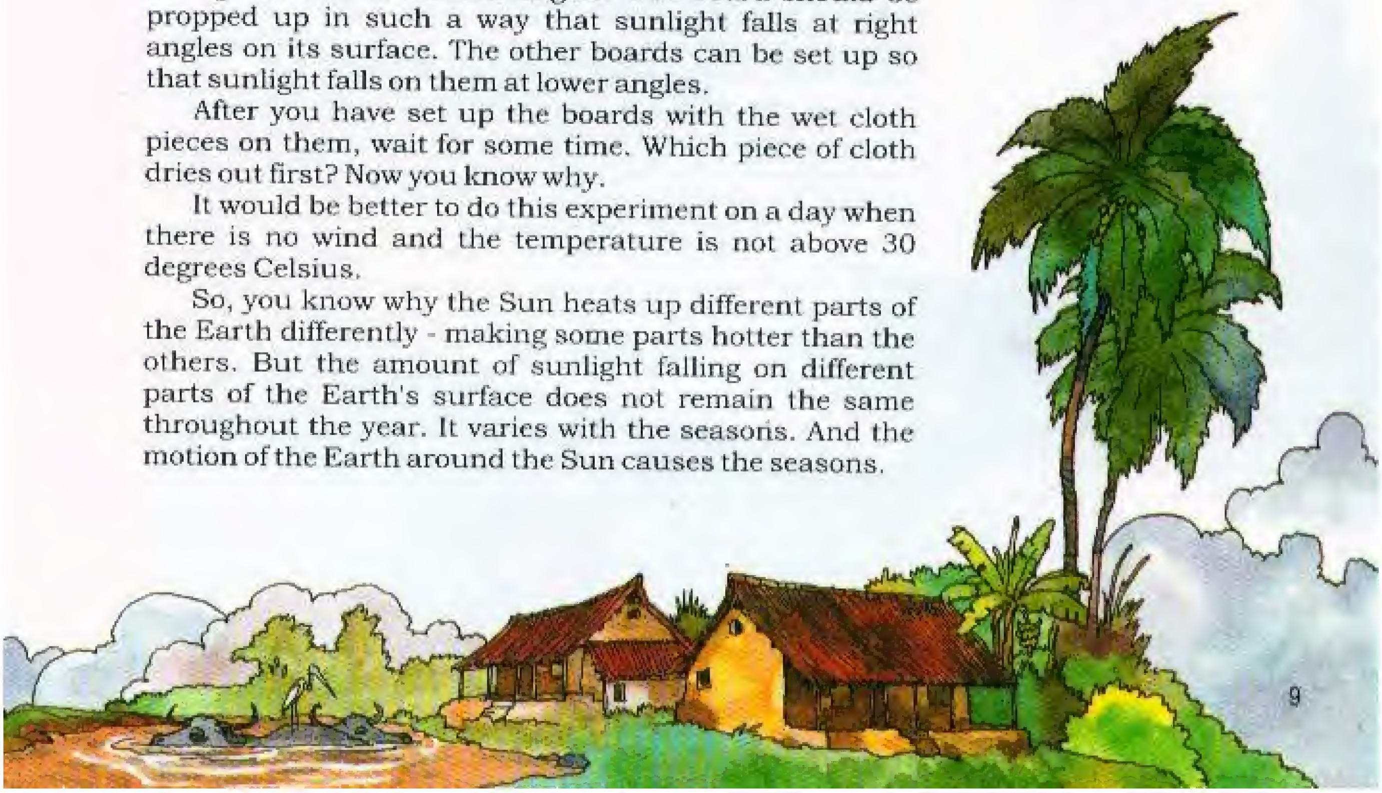
All you have to do is to soak the pieces of cloth in water, squeeze them a little and lay them flat on the boards - one piece on each board.

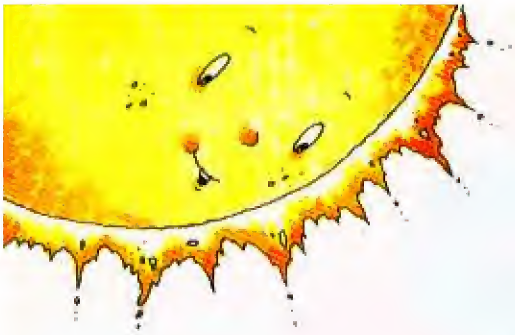
Now, take the boards out in the Sun and place them facing the Sun at various angles. One board should be propped up in such a way that sunlight falls at right angles on its surface. The other boards can be set up so that sunlight falls on them at lower angles.

After you have set up the boards with the wet cloth pieces on them, wait for some time. Which piece of cloth dries out first? Now you know why.

It would be better to do this experiment on a day when there is no wind and the temperature is not above 30 degrees Celsius.

So, you know why the Sun heats up different parts of the Earth differently - making some parts hotter than the others. But the amount of sunlight falling on different parts of the Earth's surface does not remain the same throughout the year. It varies with the seasons. And the motion of the Earth around the Sun causes the seasons.





The Sun spins on its axis once every 25 days 8 hours. But, being made of gases, all parts of its surface do not rotate at the same speed; the regions near the equator rotate faster while the regions near the poles rotate at a slower speed.

The diameter of the Sun is 400 times larger than that of the Moon, but the Sun is also 400 times farther away from the Earth than the Moon. This makes both the Sun and the Moon appear to be of the same size from Earth so that we can enjoy the beauty of total eclipses of the Sun.

We all know that the Earth spins on its axis, which makes the cycles of day and night. As it spins, the Earth also goes round the Sun, which makes the year.

As it goes round the Sun, the amount of sunlight falling on different parts of the Earth's surface changes. This happens because the Earth's axis, on which it spins, is tilted.

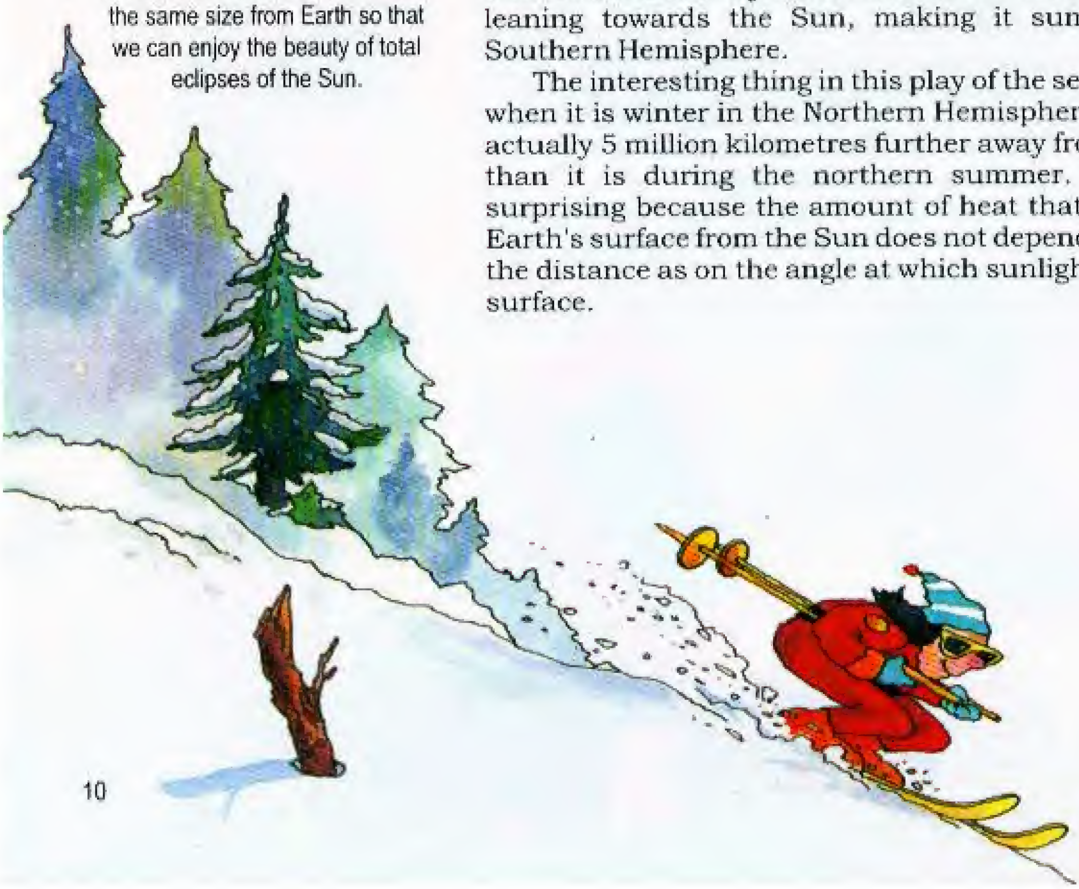
Because of the tilt of the Earth's axis, sometime the North Pole inclines towards the Sun. At another time it is the turn of the South Pole.

When the North Pole is tilted towards the Sun the countries of the Northern Hemisphere receive more sunlight and heat and it is summer in that half of the globe.

At that time, the South Pole is tilted away from the Sun. The Southern Hemisphere therefore receives sunlight at an oblique angle and thus gets less heat. Naturally, it is winter there.

The opposite happens in northern winter, when the North Pole tilts away from the Sun and the South Pole is leaning towards the Sun, making it summer in the Southern Hemisphere.

The interesting thing in this play of the seasons is that when it is winter in the Northern Hemisphere, the Sun is actually 5 million kilometres further away from the Earth than it is during the northern summer. This is not surprising because the amount of heat that reaches the Earth's surface from the Sun does not depend so much on the distance as on the angle at which sunlight falls on the surface.



Shadow Play

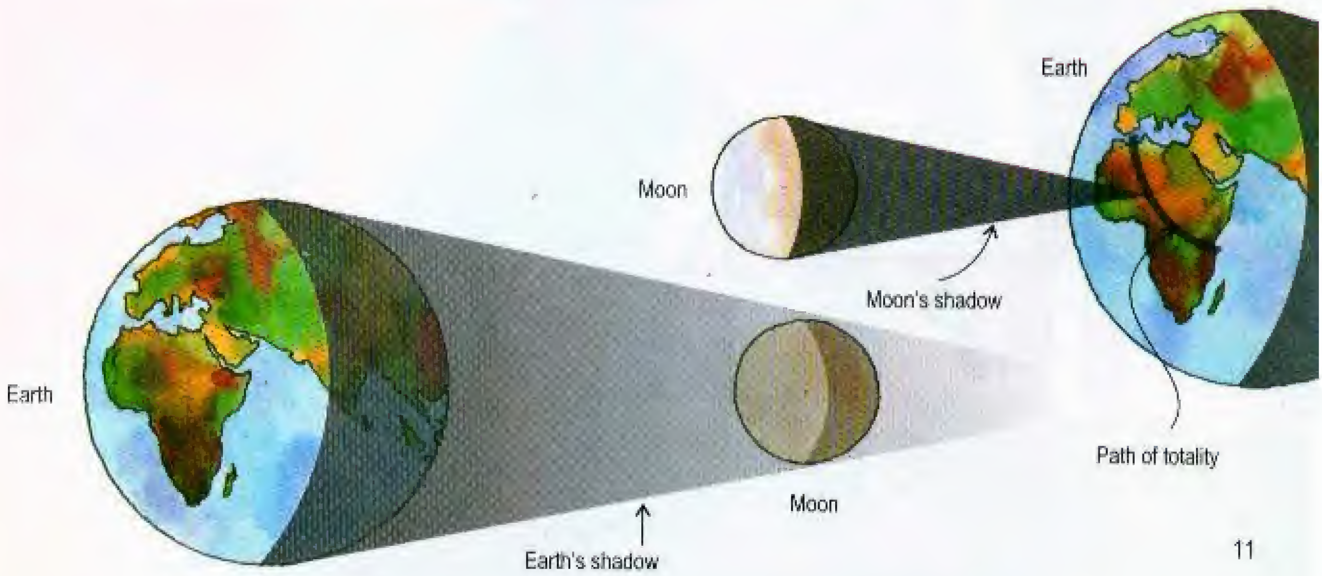
When the Sun is up in the sky, it casts shadows of all objects - trees, buildings, animals and, of course, people. But the shadows move and change direction as the Sun moves across the sky in course of the day. Early in the morning, the shadows are long and stretch in the west direction. At noon, the shadows are the shortest and stretch in a north-south direction. This is another way to find out the north-south direction. Late in the afternoon, the shadows again become long, but now they stretch towards the east.

The size of the shadow also changes with the seasons. In summer, when the Sun is high up, the days are longer and the shadows are shorter. In winter, when the Sun remains low in the sky, the days are shorter and the shadows are longer.

Even our Earth and its Moon cast shadows. Of course, we cannot always see them. Sometimes, the Moon's shadow falls on Earth. If we happen to be at a place where the shadow falls, we see a solar eclipse, when the Sun appears dark for a short time.

Sometimes, the Earth's shadow falls on the Moon. When this happens, the Moon appears dark and we have a lunar eclipse.

So, if you see an eclipse, don't feel scared. Remember that it is just the play of shadows!



The Sun Watch

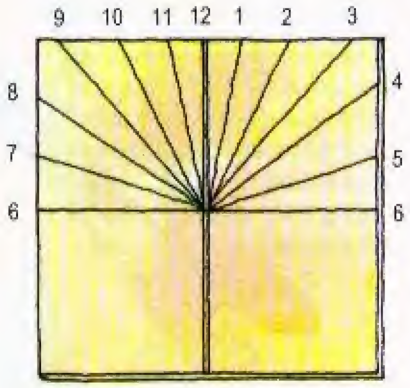
Can you use shadows to measure time? Of course, you can.

In the olden times, people didn't have clocks. They used the Sun to keep time. They had sundials on which the moving shadow of a stick or a structure called 'gnomon' was used to mark time.

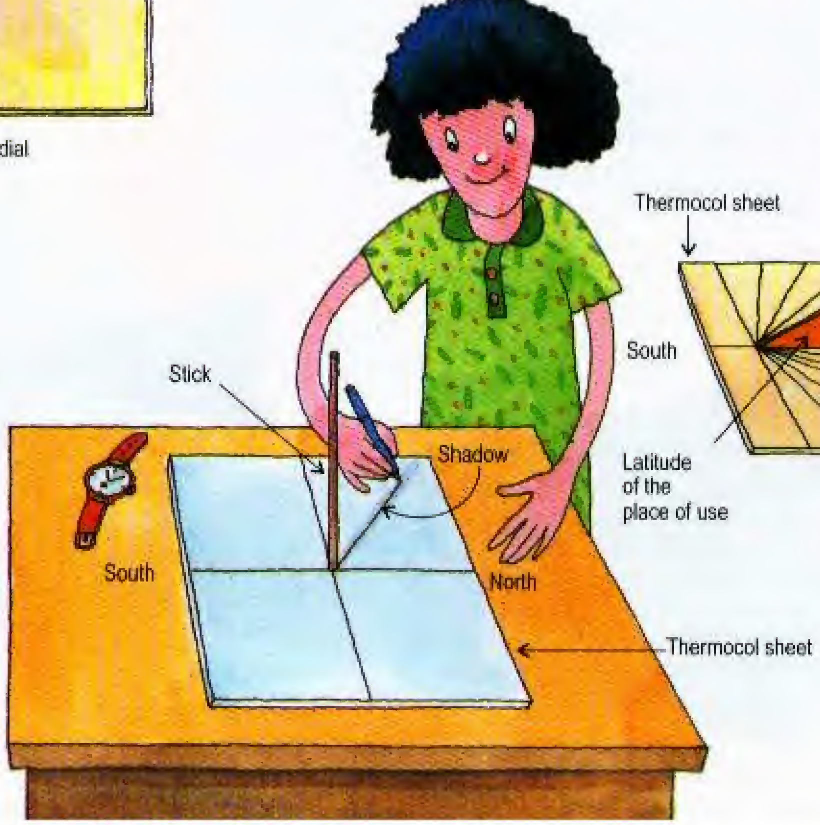
The Jantar Mantar in Delhi and Jaipur have giant sundials built of bricks and masonry by a king named Jai Singh in the 18th century.

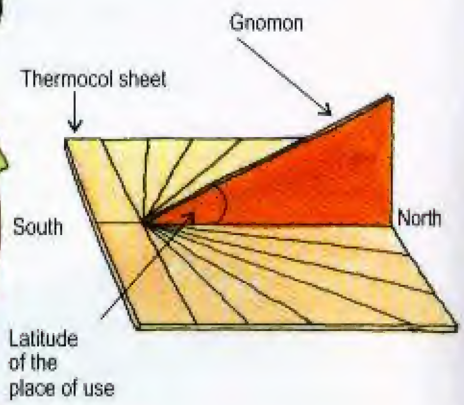
You too can build a simple sundial and use it to measure time. It can really be fun.

All you would need is a square (30cm x 30cm) piece of 1cm thick thermocol sheet or fibreboard. Mark a line straight across the middle of the board parallel to one side with a felt pen. Then make a small hole in the middle of the line and push the stick in so that it stands upright when you place the board horizontally on a table.



The finished dial





On a sunny day, place the board with the stick out in the Sun. Make sure that the line marked on the board points in the north-south direction. You'll see the shadow of the stick fall on the board.

Mark the position of the shadow on the board every hour, using a watch or a clock. Number the different positions according to the hour as on a clock dial.

You can make an even better sundial by using a triangular gnomon.

You will need a piece of thick cardboard, about 25cm long and 15cm wide, in addition to a 30cm x 30cm piece of thermocol sheet.

Cut a right-angled triangle out of the cardboard sheet. One of the base angles should be equal to the latitude of the place where you would like to use the sundial. For examples at Delhi the angle should be 28°. In other cities it would be

Calcutta	22°
Chennai	13°
Hongkong	22°
London	57°
Mumbai	19°
New York	40°.

When we look at the Sun, we actually see it as it was 8.3 minutes ago, because the light from the Sun takes that much time to reach us.

Before it dies, some 4500 million years from now, the Sun will become a Red Giant star, when it will expand to 250 times its present diameter, engulfing the planets Mercury, Venus and our Earth.

The chemical element helium is named after '*helios*', the Greek word for Sun, because it was first discovered on the Sun in 1868, by analyzing sunlight.

Recent spacecraft studies have shown that the Sun vibrates like a bell, but slowly. Each vibration takes about five minutes.

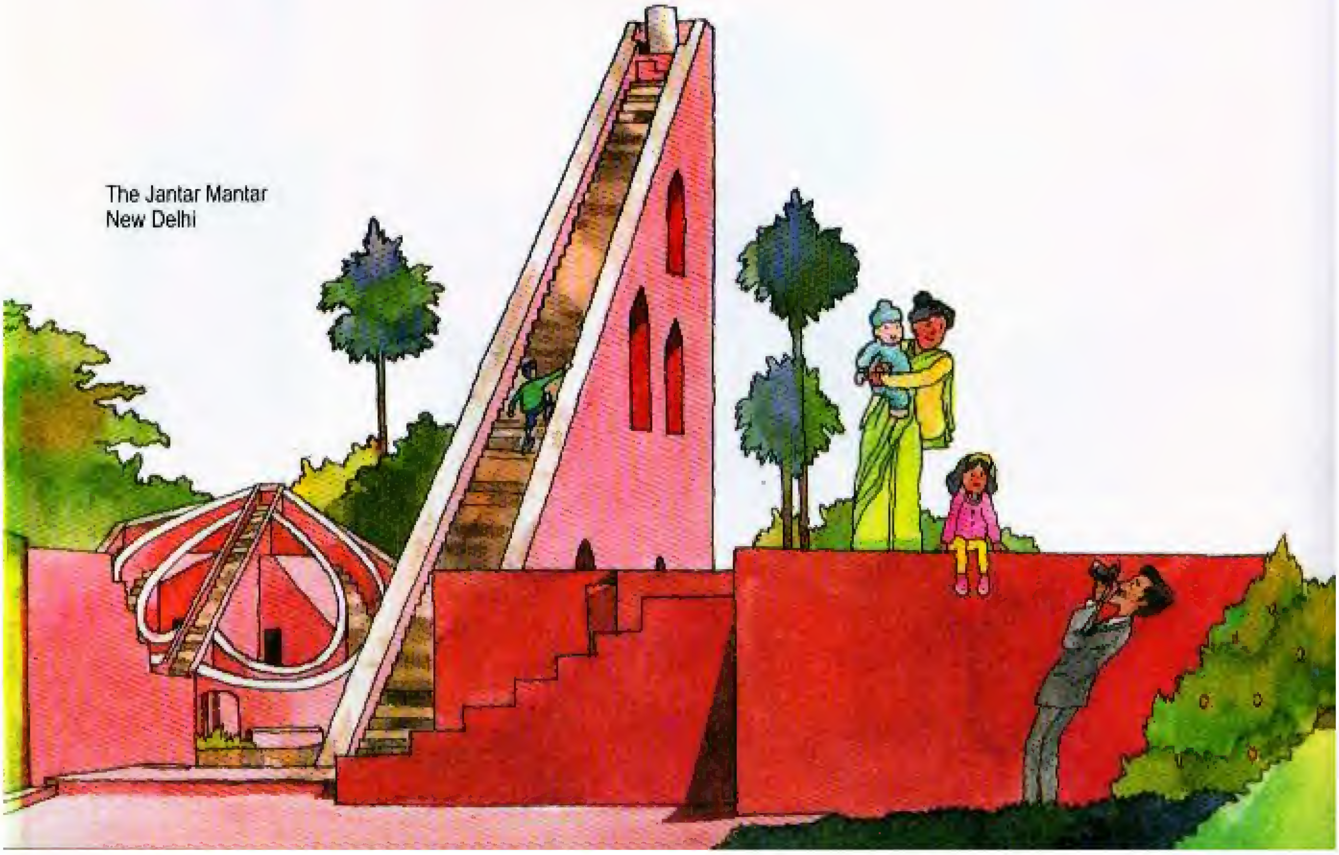
Cut a straight groove through the middle on the surface of the thermocol sheet and fix the cardboard triangle vertically.

Now place the sundial in the open so that the gnomon is aligned in the north-south direction, with the vertical edge of the gnomon towards the north.

When the Sun is up you will see the shadow of the triangle fall on the thermocol sheet. At noon, of course, there will be no shadow.

Mark the position of the shadow on the board every hour, using a watch or a clock. Draw lines to mark the hours and number the lines according to the hour. This sundial would work best at high latitudes in the northern hemisphere.

When finished, you can use your sundials to tell time on any sunny day.



The Jantar Mantar
New Delhi

The Height of It!

Many things we see around us cast shadows when the Sun is up. Tall things cast longer shadows than short ones.

Is it possible to measure the height of an object - a tall tree or a building - by its shadow? Well, it's quite simple.

All you need is a long pole or a rod, a little longer than a metre. Find an open place in a garden or a park. When the Sun is up, push the pole into the ground vertically so that 1 metre of it remains above ground.

Measure the length of the shadow cast by the pole on ground with a measuring tape. Now measure the length of the shadow cast by the tree or building, the height of which you want to measure.

You can now find out the height of the tree or building by a simple calculation. Just divide the length of the shadow of the tree by the length of the shadow of the pole. If the pole is longer or shorter than a metre, you'll have to multiply the result of the division by the length of the pole.

You can find out the height of any tall object or building in the same way.

Make Your Own Rainbow!

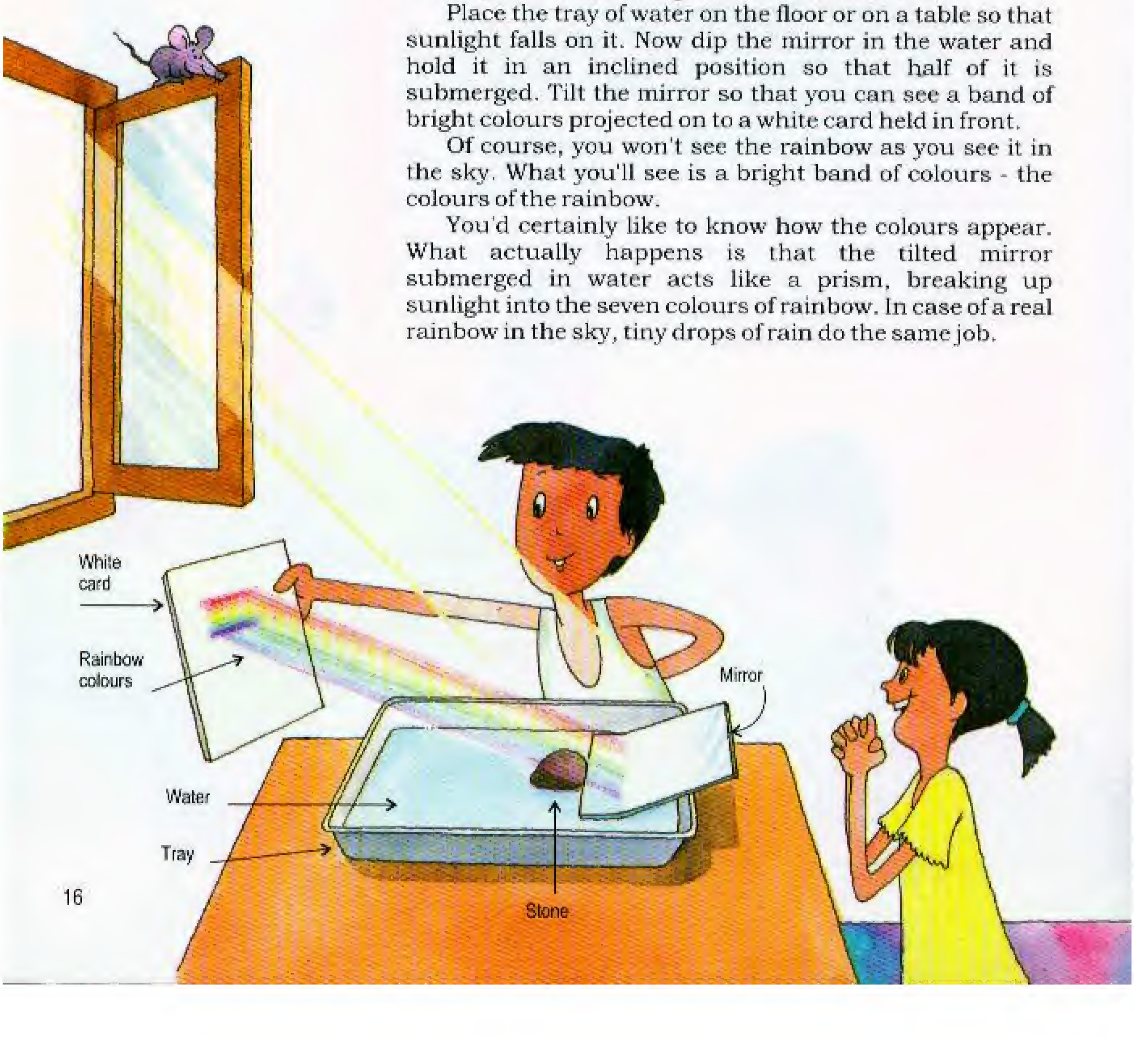
After rain, when the Sun comes out, you can sometimes see a beautiful rainbow in the sky. Where do the colours of the rainbow come from? Of course, from the sunlight. Yes, sunlight is made up of all the colours you see in a rainbow. You do not believe it? Check it out yourself.

For this you will need a tray of water and a small mirror. And you have to be in a room with a window or a balcony where the sunlight comes from one side.

Place the tray of water on the floor or on a table so that sunlight falls on it. Now dip the mirror in the water and hold it in an inclined position so that half of it is submerged. Tilt the mirror so that you can see a band of bright colours projected on to a white card held in front.

Of course, you won't see the rainbow as you see it in the sky. What you'll see is a bright band of colours - the colours of the rainbow.

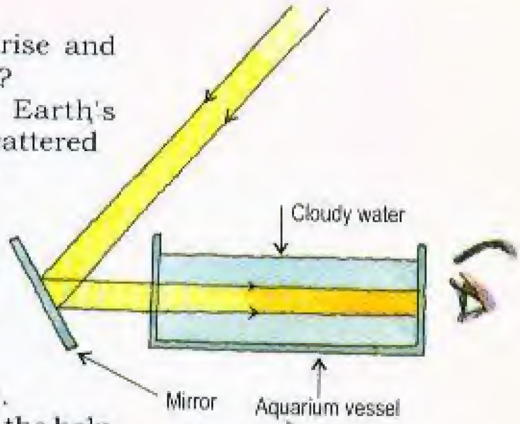
You'd certainly like to know how the colours appear. What actually happens is that the tilted mirror submerged in water acts like a prism, breaking up sunlight into the seven colours of rainbow. In case of a real rainbow in the sky, tiny drops of rain do the same job.



Why Does the Sun Go Red?

The colour of sunlight is white. But at sunrise and sunset why does the Sun look reddish orange?

As the sunlight passes through the Earth's atmosphere, some colours, especially blue, are scattered by the dust and smoke particles present in the atmosphere. That is why the daytime sky is blue. When the Sun rises or sets, the sunlight has to pass through a much thicker layer of the atmosphere and thus through more dust and smoke particles. As a result so much blue is scattered away that only the red and yellow reach our eyes and the Sun appears red or orange.



You yourself can find out how it happens with the help of someone grown up.

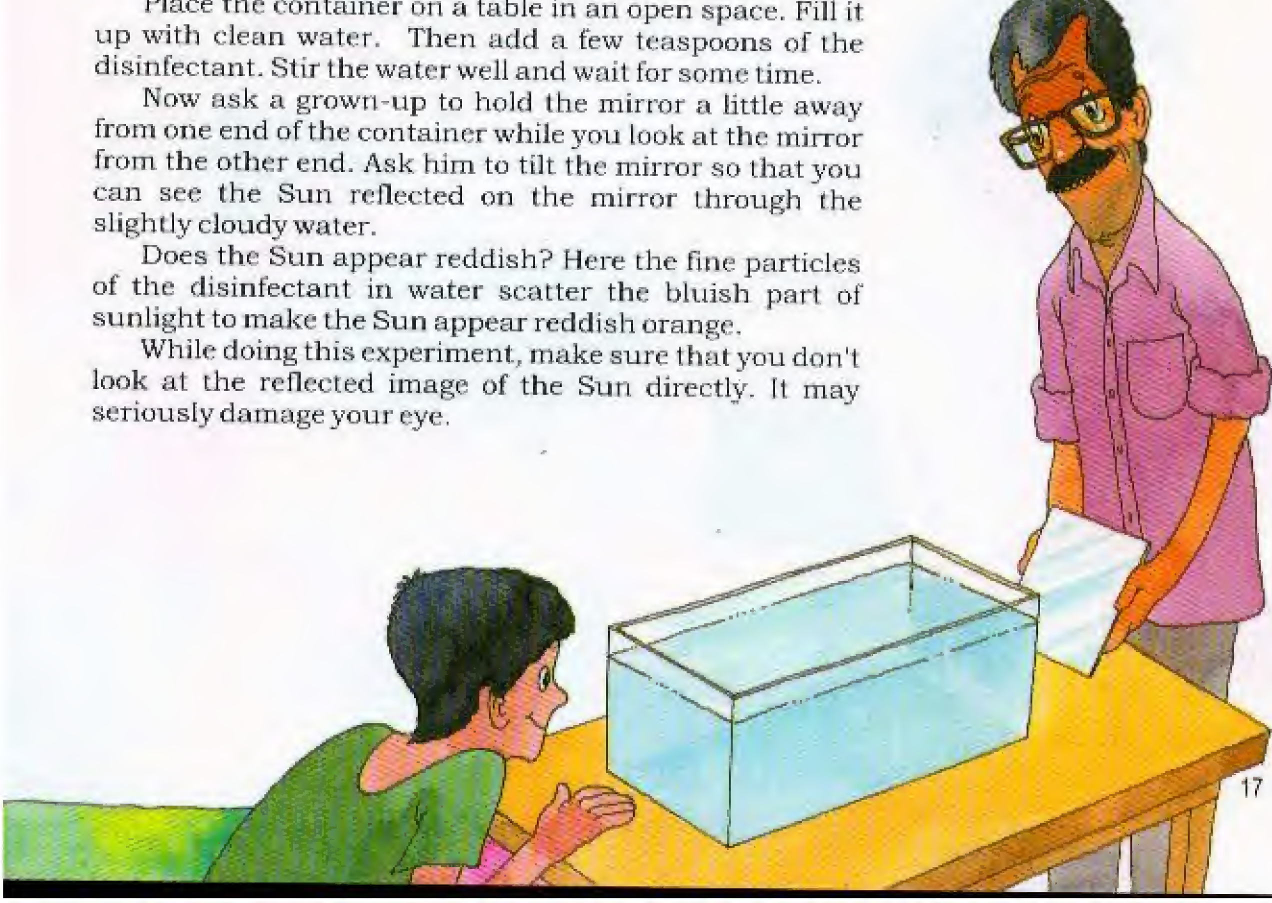
You will need a large glass container that can hold about 10 litres of water. An aquarium tank would be ideal. You will also need a few spoons of Dettol or some other disinfectant, and a small mirror.

Place the container on a table in an open space. Fill it up with clean water. Then add a few teaspoons of the disinfectant. Stir the water well and wait for some time.

Now ask a grown-up to hold the mirror a little away from one end of the container while you look at the mirror from the other end. Ask him to tilt the mirror so that you can see the Sun reflected on the mirror through the slightly cloudy water.

Does the Sun appear reddish? Here the fine particles of the disinfectant in water scatter the bluish part of sunlight to make the Sun appear reddish orange.

While doing this experiment, make sure that you don't look at the reflected image of the Sun directly. It may seriously damage your eye.



The Colour of Heat

Besides light, the Sun also gives us heat. We can feel the heat if we stand in the Sun. In summer, we feel hotter because the Sun shines almost overhead. In winter, when the Sun remains low in the sky, we receive less heat from it because the Sun's rays reach us obliquely.

If you keep an object in the Sun it gets hot. But all objects don't get hot equally. For example, metal objects get hotter than objects made of plastic or wood.

How hot an object becomes also depends on its colour. You can find out which colour heats up faster doing a simple experiment.

Take four square pieces of cardboard and paint them white, black, yellow and blue with poster colours. Let them dry thoroughly. Now put a pinch of powdered wax on each of the coloured square pieces and keep them in the mid-day Sun. Does the wax on all the pieces melt at the same time? If not, wax on which of the coloured pieces melts first?

You'll notice that the wax on the black coloured piece melts first. This is because the black colour absorbs all the light and heat of the Sun's rays that fall on it. So it becomes hot much faster than the white, yellow and blue coloured pieces.

Since white colour reflects almost all the heat and light falling on it, it absorbs very little heat. That is why it is more comfortable to wear white or light-coloured clothes in summer. Similarly, painting the outer side of buildings white in hot countries keeps them cool inside.

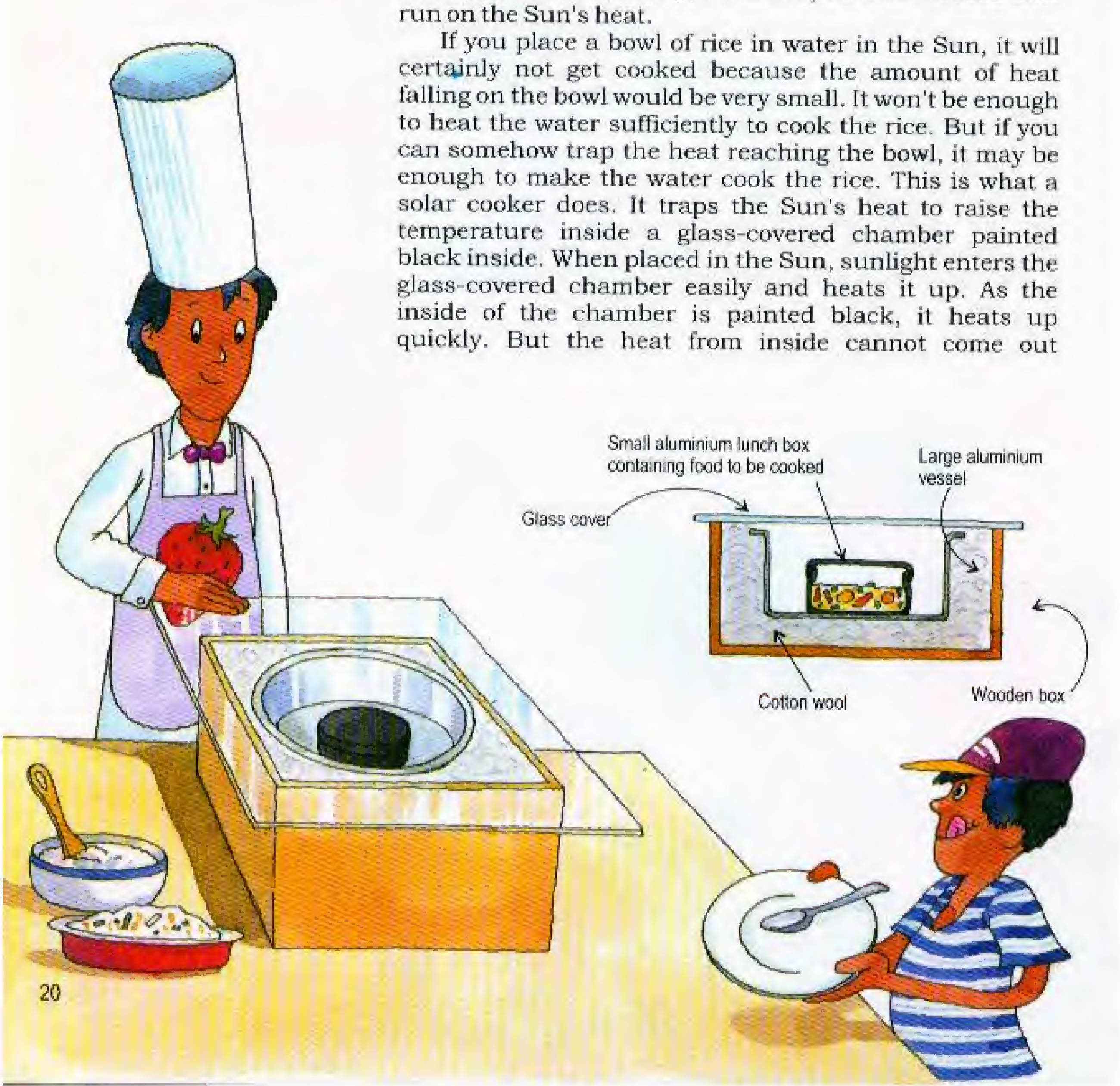
The diameter of the Sun is about 110 times that of the Earth, but its volume is large enough to hold more than a million Earths.

Although the volume of the Sun is more than a million times that of the Earth, its mass is only 330,000 times as large because most of it is made up of light gases, mainly hydrogen and helium.

Make Your Own Solar Cooker!

Can you cook without fire? Perhaps you will say, no. After all, man became different from animal when he learnt to make fire for cooking. Even in the modern age one cannot think of cooking without some kind of fire, produced by burning wood, coal or gas in a stove. But cooking without fire is possible, if you use cookers that run on the Sun's heat.

If you place a bowl of rice in water in the Sun, it will certainly not get cooked because the amount of heat falling on the bowl would be very small. It won't be enough to heat the water sufficiently to cook the rice. But if you can somehow trap the heat reaching the bowl, it may be enough to make the water cook the rice. This is what a solar cooker does. It traps the Sun's heat to raise the temperature inside a glass-covered chamber painted black inside. When placed in the Sun, sunlight enters the glass-covered chamber easily and heats it up. As the inside of the chamber is painted black, it heats up quickly. But the heat from inside cannot come out



through the glass cover. As a result, the temperature inside can go up to about 100 degrees Celsius within a few hours, which is hot enough to cook rice or vegetables.

You can make a solar cooker of your own. For that you will need a wooden box large enough to hold a round, flat-bottomed aluminium vessel of about 30cm diameter. You'll also need a small aluminium lunch box with cover, some pads of cotton wool, and a sheet of glass to cover the wooden box.

First, paint the inside of the large aluminium vessel with a dull black paint. After the paint dries, place the vessel on a layer of cotton wool spread at the bottom of the wooden box. Then pack cotton wool all around the space between the sides of the box and the aluminium vessel for insulation. Paint the entire outer surface of the lunch box, including the cover, with dull black paint and let it dry. Your solar cooker is ready now.

Put whatever you want to cook, it may be rice, pulses, or vegetables, in the lunch box with sufficient water. Cover it and place it in the box. Place the glass sheet over the open top of the box and put it in the Sun. In summer, it will take two to three hours of full sunshine to cook simple rice, pulses or vegetables with your own solar cooker. But it can be real fun.

When you cook with the Sun's heat you are actually using solar energy, which is clean and inexhaustible and good for our environment.

All the Sun's energy is produced in the same way as in a hydrogen bomb, by the nuclear fusion of hydrogen into helium.

The sun loses 5 million tons of its mass as energy every second. It has been losing mass at this rate for more than 4500 million years and is expected to do so for another 4500 million years!

Sun Cleans Water

Can you purify water using Sun's heat?

Well, it is happening every day. The clouds we see in the sky are nothing but tiny droplets of pure water. Sun's heat makes water in oceans, rivers and lakes turn into water vapour, which rises up into the sky. As it rises, the water vapour also cools and becomes tiny droplets of pure water, which form the clouds. When it rains, the pure water falls back on Earth and flows into the lakes and rivers providing drinking water for us.

You too can turn dirty or salty water into pure water using the Sun's heat.

All you would need is a large plastic bowl, a small glass bowl or tumbler, a sheet of transparent plastic film, a rubber band and a small pebble.

Fill some dirty or salty water into the large bowl and place the glass bowl or tumbler in the middle. (If you use a small plastic bowl or tumbler, it will float in the water. So it is better to use a glass bowl or tumbler, which is heavier.) Cover the open mouth of the container with a plastic sheet and secure it with the rubber band. The

sheet should not be fixed tightly. When you place the pebble in the middle of the sheet, it should sag, forming a conical depression.

Now place the large bowl in the Sun. If you open the plastic sheet after several hours, you will find clean water collected in the glass bowl or tumbler, good enough to drink.

Do you know where the water came from?

The Sun's heat turned water in the larger bowl into vapour. When the vapour came in contact with the underside of the plastic film, which was cooler, it turned into tiny droplets of water. As more and more droplets collected, the water dripped into the tumbler and collected there.

What you have just built is a solar still. Solar stills are widely used for getting drinking water from salty water. This is yet another example of the use of solar energy.

Fire! Fire!

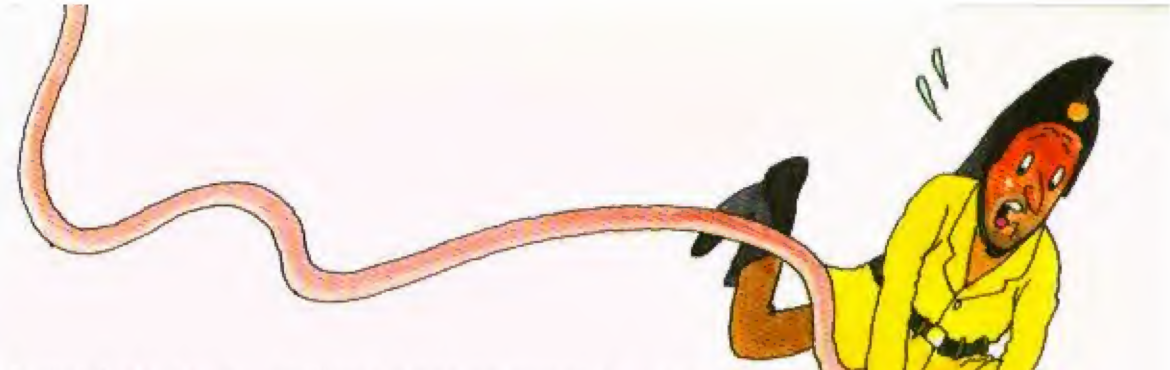
We all know that the Sun gives out heat and things become hot when placed in the Sun. But did you ever imagine that Sun's heat can be used to start a fire? Yes, you can burn things using sunlight. And to do that all you need is to have some means to gather as much sunlight as possible into a small area so that the amount of heat collected becomes quite large.

A simple way of collecting Sun's heat is by using a magnifying glass, which your grandfather may be using for reading newspaper in the morning. When seen through a magnifying glass, things appear bigger, and so, easier to see.

If you get a magnifying glass of about 5cm diameter, you can use it to set a piece of paper on fire. All you have to do is to go out in the Sun and hold the magnifying glass over a piece of dry tissue paper. Move the magnifying glass over the piece of paper to make a sharp image of the Sun on it.

The sun, with a diameter of 1.4 million kilometres, is only a moderate-size star. The largest star known has a diameter almost 30,000 times bigger.

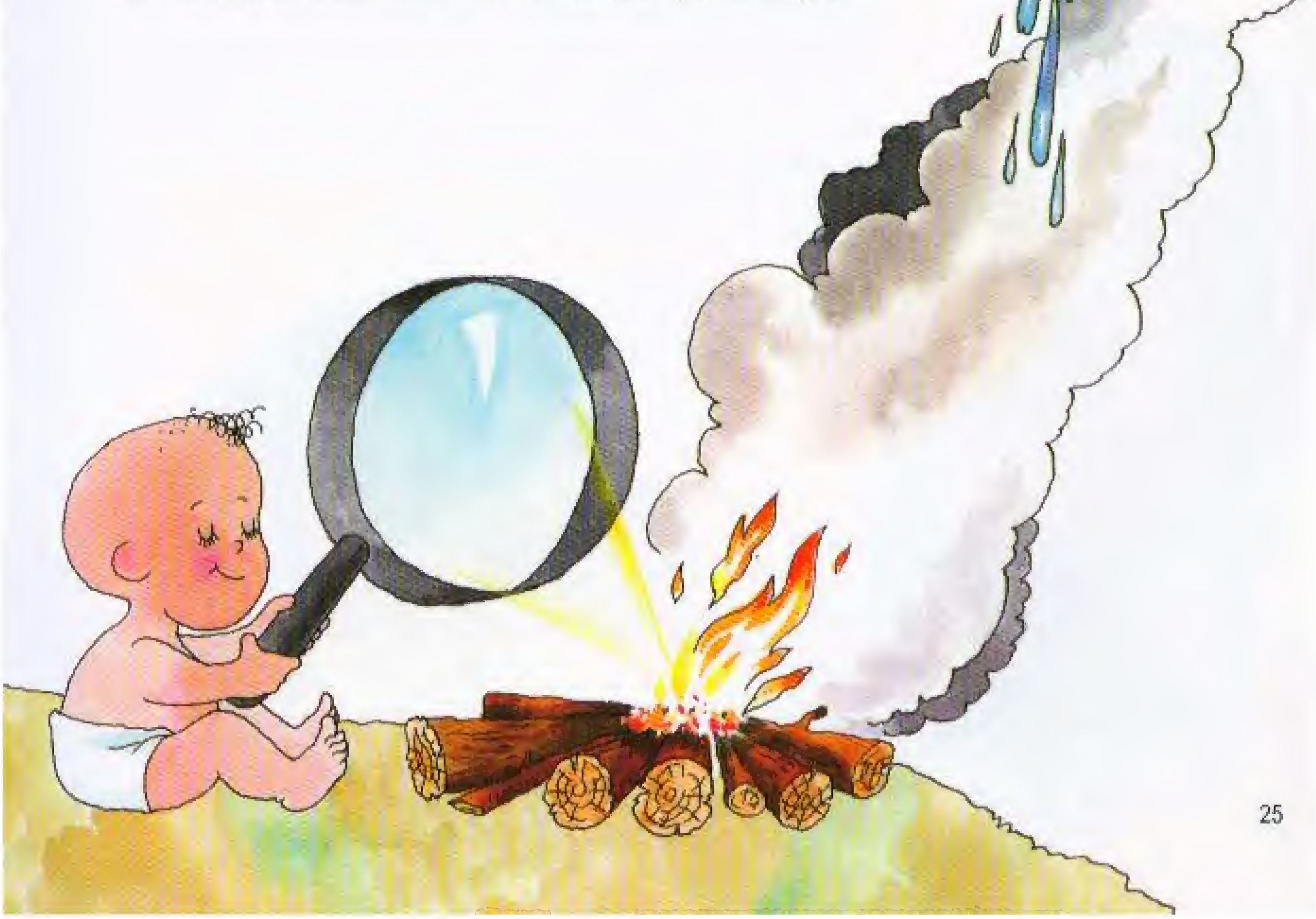
The Sun was born about 4500 million years ago from a cloud of dust and gas when the nuclear furnace at its core was ignited.



If you hold the magnifying glass properly, the image will appear as an extremely bright point of light. It appears as a bright point because the magnifying glass bends all the light falling on it and gathers it into that small area.

If you hold the magnifying glass steady over the piece of paper for some time, you'll soon see smoke coming out from the bright spot. This is because the tremendous heat produced at the bright spot sets the piece of paper on fire. If you use a piece of black or carbon paper, it will take much less time to catch fire because black colour absorbs more heat than white or light coloured paper. And if you use a larger magnifying glass, that too will make the paper catch fire faster because larger the area of the magnifying glass the more is the amount of heat collected and focussed on to the bright spot.

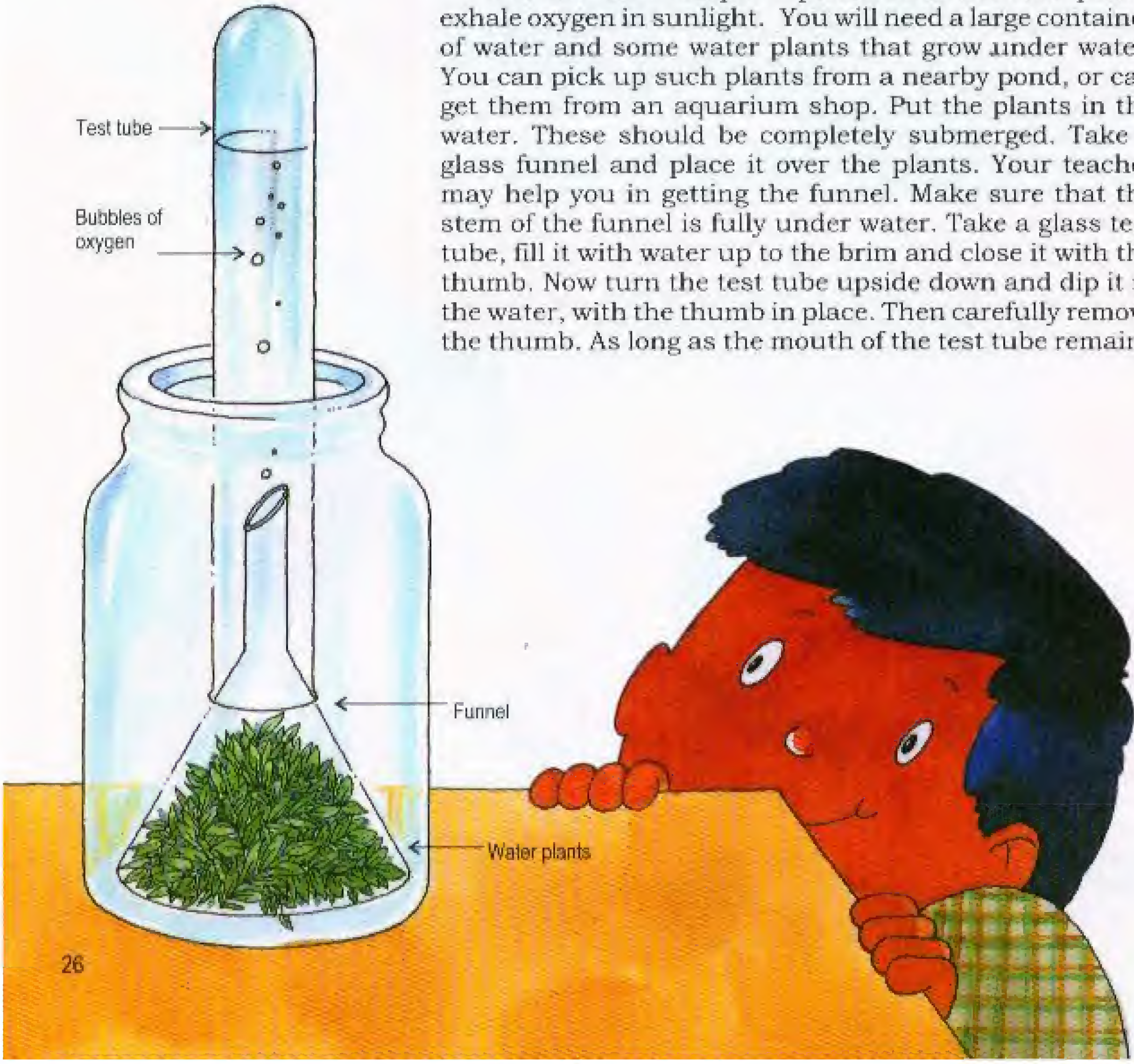
While doing this experiment, remember to keep the burning paper away from your clothes or any other object.



Green Life

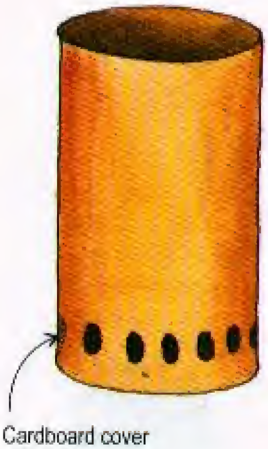
We live in a world surrounded by green plants. Do you know, without green plants we would all die because there would be no oxygen for us to breathe? Green plants produce life-giving oxygen by taking in carbon dioxide from air and water from the soil. The green colouring matter in the leaves carries out the conversion in presence of sunlight. If there were no sunlight, there won't be any green plants. And if there were no green plants there would be no oxygen in the air.

You can do a simple experiment to see how plants exhale oxygen in sunlight. You will need a large container of water and some water plants that grow under water. You can pick up such plants from a nearby pond, or can get them from an aquarium shop. Put the plants in the water. These should be completely submerged. Take a glass funnel and place it over the plants. Your teacher may help you in getting the funnel. Make sure that the stem of the funnel is fully under water. Take a glass test tube, fill it with water up to the brim and close it with the thumb. Now turn the test tube upside down and dip it in the water, with the thumb in place. Then carefully remove the thumb. As long as the mouth of the test tube remains



under water no water will flow out of it. Now move the upturned test tube carefully to bring its open mouth (keeping it under water) over the funnel stem.

Now take the container outside and keep it in the Sun. Soon, you will see bubbles rising from the green leaves of the submerged plant and collecting in the test tube. When there is enough gas, insert a glowing matchstick into the test tube. It will burst into flame showing that the gas is oxygen.



Cardboard cover with holes

Apart from giving out oxygen, green plants also make use of sunlight to make food. Plants using sunlight make all the food we eat - rice, wheat, vegetables and fruits. If the sunlight is cut off, the plant is not able to make food, and it dies. To find out, you will need two potted plants. It'll be better if the pots are small.

Using cardboard and tape, make two covers to be put over one of the potted plants. One cover should be smaller than the other. Make holes on both the covers so that air is not cut off but also make sure that no light can enter. Keep both the pots in a place where sunlight is available for a few hours every day. Cover one of them and keep the other uncovered. Keep the two plants undisturbed for about a week. You can, of course, take off the covers in the dark after sunset for watering the covered plant if necessary. But never expose it to any light.

Take the covers off after a week or ten days and look at the two plants. Do they look different? The difference is because one of them got the sunlight to make food and the other did not.

Where's the Colour Gone?

When you buy a new dress, you often see a label that says 'dry in the shade'. Window curtains lose colour when exposed to the Sun day after day. Book jackets and cinema posters also fade when exposed to the Sun for a long time. But there are colours that do not fade in the Sun. They are called fast colours.

You can find out for yourself, which colours are fast and which are not. Collect as many samples of coloured or dyed cloth as possible. Also collect samples of coloured paper such as packing paper, decorating paper, chart paper and others. You'll get better results if you choose dark colours.

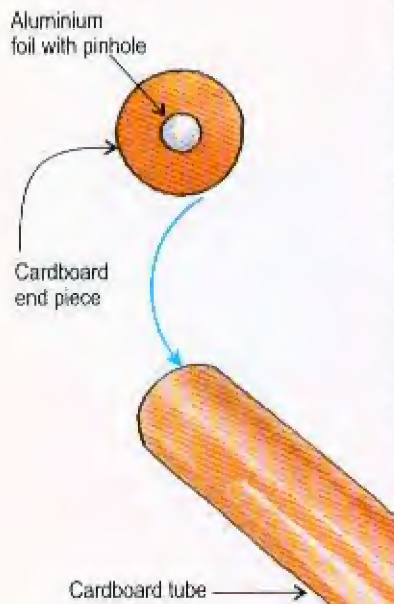
Now cut each of the cloth and paper samples into two pieces. Put one piece of each on a tray and keep the tray in the Sun for a few days. Keep the other piece of each in the shade, away from the Sun.

After exposing the pieces to the Sun for a few days compare each piece with its other half. How much have they faded? Expose the pieces for a few days more and see the difference. You will find that some of the colours fade pretty fast, while others take longer to fade. There will also be some that would not fade even after repeated exposure to the Sun.

Why do the colours fade? Apart from visible light that we can see, sunlight also contains light of colours that we cannot see. One such colour is called ultraviolet. It is the ultraviolet part of sunlight that is responsible for the fading of colours. And that is why your new colourful dress should never be dried in the Sun but in the shade.

Giant explosions can sometimes be seen near sunspots, which spew out powerful streams of electrically charged particles that can disrupt radio and TV transmission and cause power failures and spectacular auroras on Earth.

Sun Spotting at Home



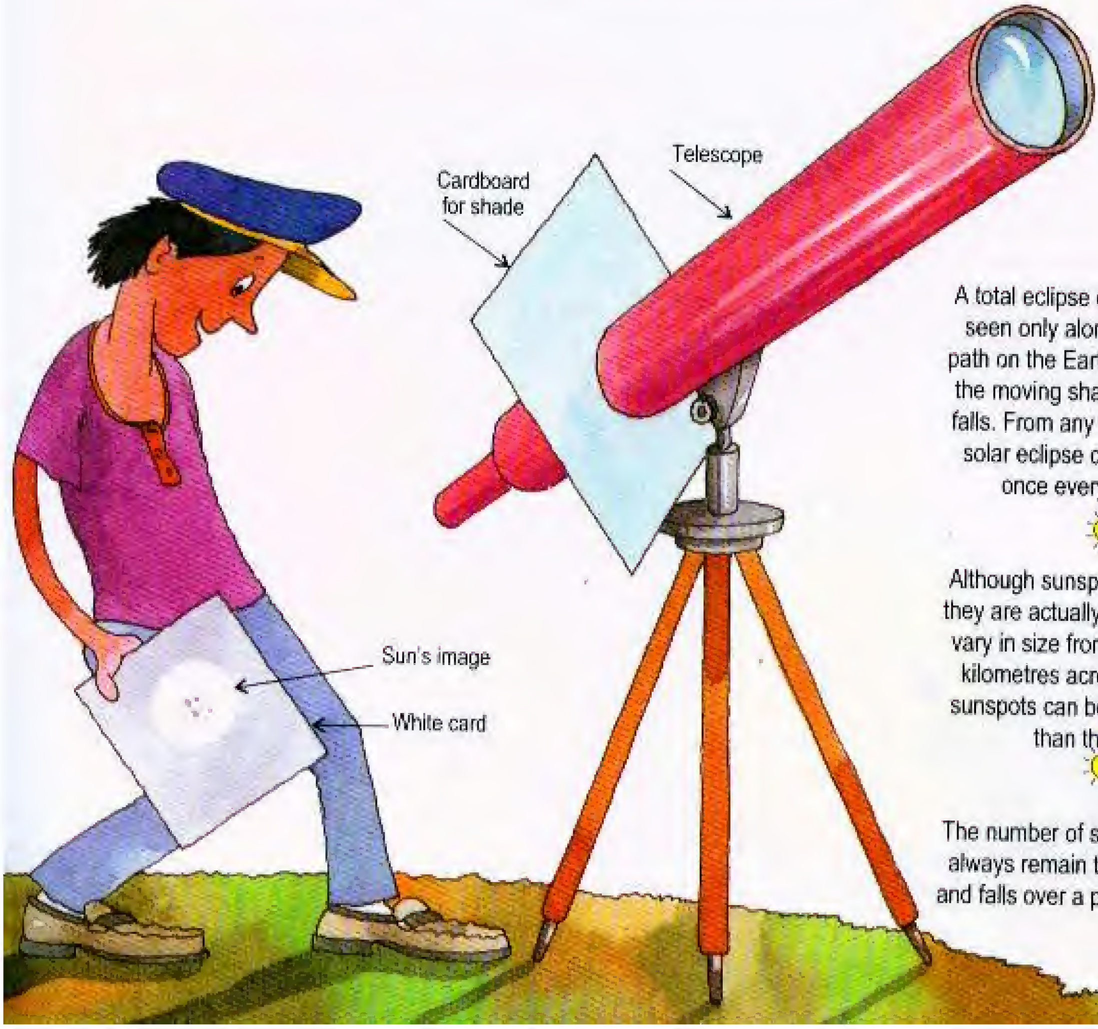
The Sun is the brightest object in the sky. It is so bright that if we look at it directly, we'll go blind. So we should never look at the Sun directly. Even sunglasses are not safe for looking at the Sun. The best way to look at the Sun is to look at the image of the Sun formed by a pinhole camera or by a small telescope and projected on a white surface. If you do that you can see a very interesting thing. You can see spots on the Sun.

The Sun looks very bright because its surface is very hot. It has a temperature of about 6000 degrees Celsius, that is, sixty times as hot as boiling water. Sometimes, small areas on the Sun become cool and they appear dark. These are known as sunspots. They appear as black dots of different sizes on the face of the Sun.

You can build a simple pinhole camera by taking a 45cm long tube made of cardboard. It should have a diameter of at least 10cm. Cover one end of the tube with a piece of cardboard with a 2cm hole in the middle. Fix a small piece of

aluminium foil over the hole with tape. Then pierce the centre of the foil with a pin to make a tiny hole. At the other end of the tube attach a piece of tracing paper with tape. Your pinhole camera is now complete. For better viewing you can add a cardboard hood over the end with tracing paper.

To see sunspots, just point the pinhole end of the tube towards the Sun. If the tube is correctly pointed at the Sun, you'll see a faint image of the Sun formed on the tracing paper at the other end. The image will be quite small - about 75mm in diameter. If you observe carefully, you may be able to see a few sunspots on the Sun's image.



A total eclipse of the Sun can be seen only along a very narrow path on the Earth's surface where the moving shadow of the Moon falls. From any one place, a total solar eclipse can be seen only once every 360 years.

Although sunspots appear small, they are actually quite large. They vary in size from 1000 to 40,000 kilometres across. The largest sunspots can be ten times wider than the Earth.

The number of sunspots does not always remain the same. It rises and falls over a period of 11 years.

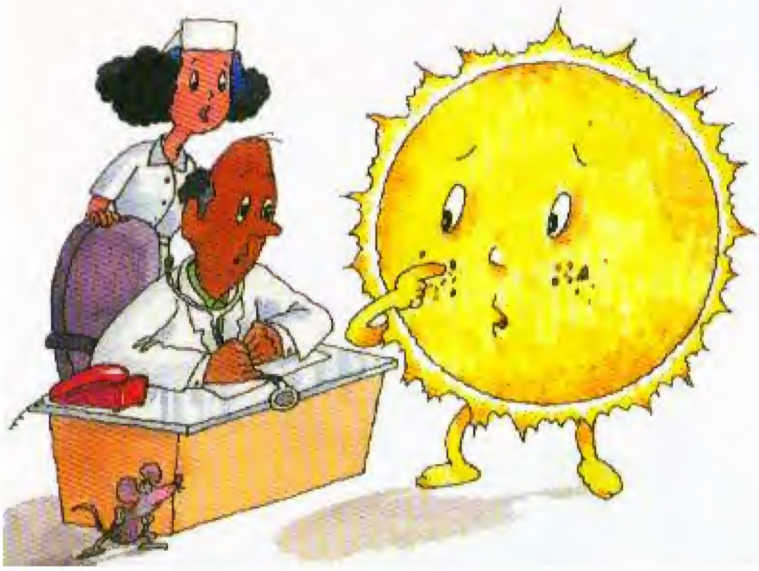
Sunspots are actually cooler areas on the surface of the Sun, which appear dark because of their lower temperature (about 4000 degrees Celsius) compared to the rest of the Sun's surface (about 6000 degrees Celsius). They usually appear in pairs and may last from a few days to many months.

The image created by a pinhole camera is very faint and it may be quite difficult for you to find the tiny dark dots on the faint image. If you want to have a brighter image you'll have to get a small telescope - one with a magnification of 10" will do. You can even use a pair of binoculars for this purpose, but you have to cover one of the front lenses so that you get only one image of the Sun.

Mount the telescope on a stand and point it at the Sun. You needn't look through the telescope. You can do it by looking at the shadow cast by the telescope tube on a piece of white card held a little distance away from the eyepiece of the telescope. When the telescope is correctly pointed it will throw a bright image of the Sun on the card. Adjust the eyepiece of the telescope to get a sharp image. If you observe carefully you can see quite a few dark spots on the Sun's image.

Using this method, bright images of the Sun, as large as 10cm in diameter, can be easily seen.

If you look at the Sun's image every few days, you will see that the spots do not stay fixed at one place. They slowly move from one side to the other. What does this means? It means that the Sun too spins like the Earth. Interesting, isn't it?




Do you know how to:
Do Sun-spotting at home?
Create a rainbow of your own?
Measure the shadows and tell the time?
Make a solar cooker of your own?
Knowing Sun is real fun... you can do lots and lots of things with him.
Treat yourself to this book!